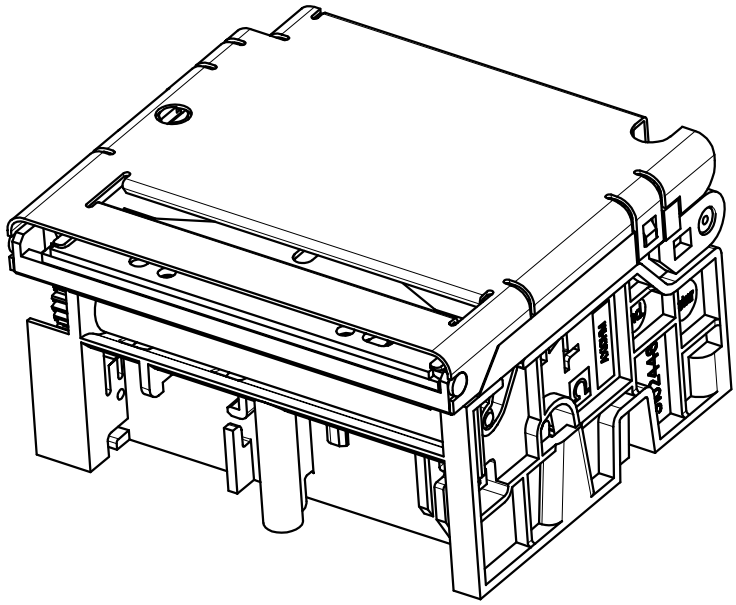
THERMAL PRINTER COMPONENTS

CM/RMDL MINI-PRINTER SERIES
60 MM PRINTER MECHANISM

USER MANUAL

Reference 3106289 Issue B
October 2003



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EVOLUTIONS

Date	Issue	Modifications
09/00	Z	Creation
	A	Update
09/03	B	Update : addition of opto-sensor information

IMPORTANT

This manual contains the basic operations for running your printer.

Read it carefully before using your printer.

Pay special attention to the chapter “Recommendations”.

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1 UNPACKING

Each printer mechanism is packaged in an antistatic bag. Observe precautions for handling in electrostatic protected areas.

2 GENERAL OVERVIEW

Based on static thermal printing technology, the RM series is a family of user-friendly, highly reliable devices which have been specially designed to fit in the minimum space. A robust guillotine cutter is set to this printer mechanism for ticket cutting.

Very small size printer and cutter
Silent mechanism
8 dots/mm print-head
Easy to connect (only one connector for motor, print head, opto-sensor and cutter)
Front and bottom paper introduction possible

SUMMARY OF PRINTER SPECIFICATIONS

The following table provides the main specifications of the CM/RMDL mechanism series.

ITEM	VALUE	UNITS
Printing method	Static thermal dot line printing	-
Printing width	48	mm
Printing speed	75	mm/sec max
Paper loading	Auto-load	-
Paper width	60	mm
Maximum paper thickness	80	µ
Recommended paper	2320061	AXIOHM reference
Number of resistor dots	384	-
Resolution	8	dots/mm
Number of steps / dot line	1	-
Paper feed / dot line	0.125	mm
Head temperature detection	By Thermistor	-
Out of paper detection	Opto-sensor	-

SUMMARY OF PRINTER SPECIFICATIONS 1 (Continued)

Maximum duty cycle *t*On / *t*Off (*to avoid motor temperature rise*) (Max 2 sec "on")		40	%
Storage temperature range		- 20 to + 60	°C
Operating temperature range		0 to + 50	°C
Relative humidity range (*operating*)		20 to 85 *no condensing*	%
Operating voltage range Vcc (*logic*)		4.75 – 5.25	V DC
Operating voltage range Vch (*dot*)		10 to 15.2 operating (*16 standby*)	V DC
Peak print head current (*all dots "on" at nominal value*)		10.8	A
Current consumption: V ch (*at nominal value*)		28	mA per resistor dot "on "
Current consumption: V cc (*at nominal value*)		100	µA
Current consumption: stepping motor for paper feed		600	mA
Current consumption: stepping motor for cutter		1800	mA
Electrical life time*		10^8	pulses
Mechanical life time*		50	Km
Cutter life time (for RMxx)		1 000 000 cuts (with paper reference 2320061)	-
Over all dimensions:	Height Width Depth	42.1 74.5 65.75	mm mm mm
Weight (*average*) (*without paper roll*)		250	g

*** Per AXIOHM standard test conditions (which are mainly: 24V, 25 °C, dot printing duty cycle = 30 %)**

3 MECHANICAL SPECIFICATIONS

3.1 General description

The mechanism consists of:

Plastic chassis
Robust guillotine cutter
Stepping motor
Gear train
Print head
End of paper opto-sensor

3.2 Dimensions and weight of the complete mechanism

Height:..... 42.1 mm
Depth:..... 65.75 mm
Width (without rewinder option):…. 74.5 mm
Weight:..... 250 g

3.3 Mechanical views

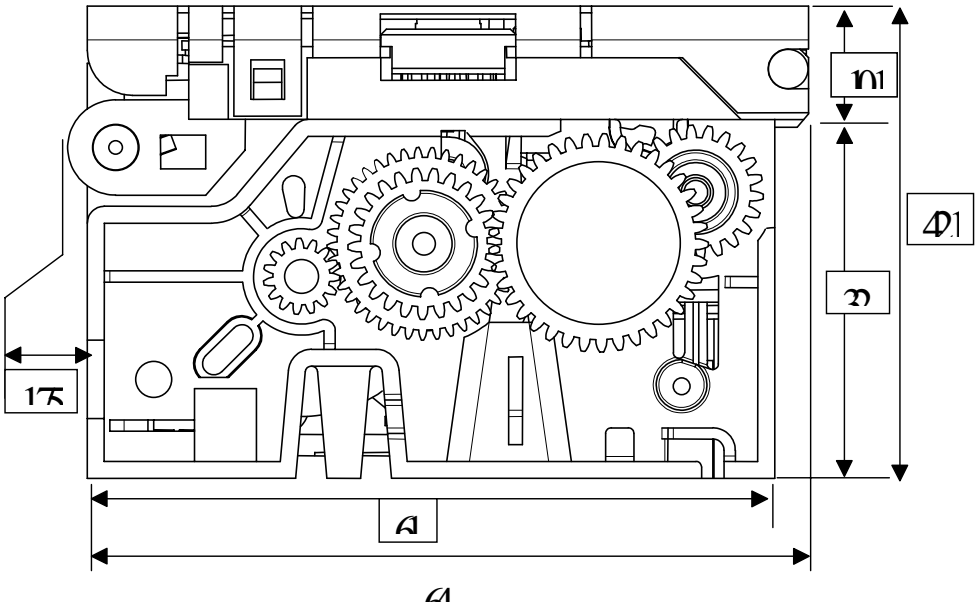


Fig. 1 Side view with cover

Mechanical views (continued)

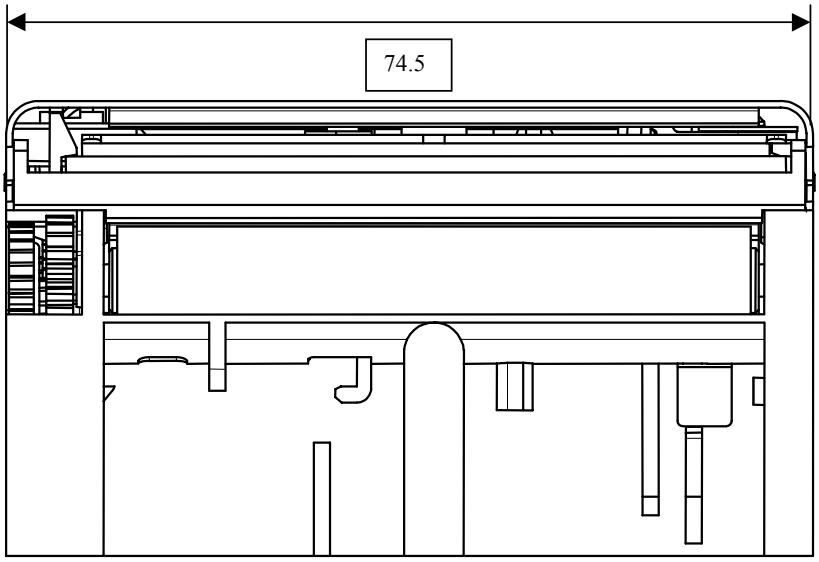


Fig. 2 front view with cover

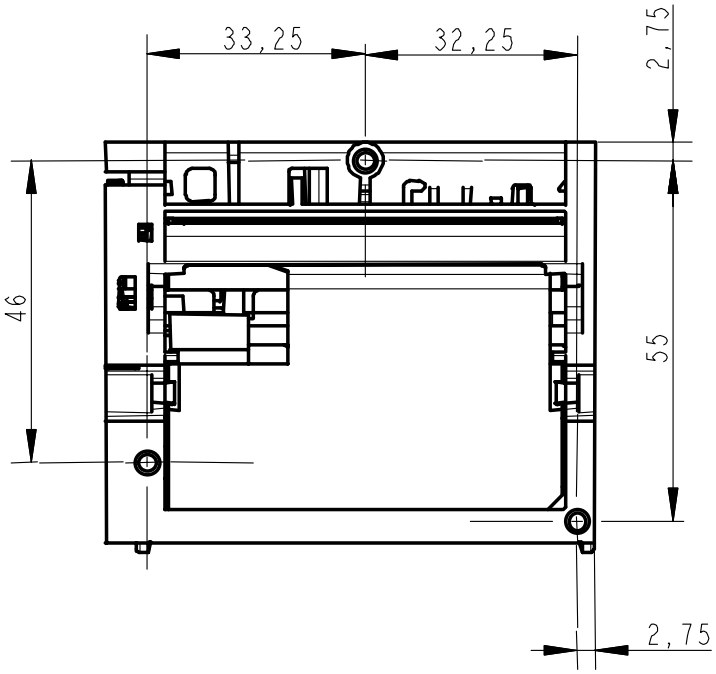


Fig. 3 bottom view / fixing holes

Use self threader screws for plastic, the fixing holes diameter being 2.5 mm, use a maximum diameter of 3 mm for screws and a maximum depth in chassis of 7 mm (from the external edge of holes).

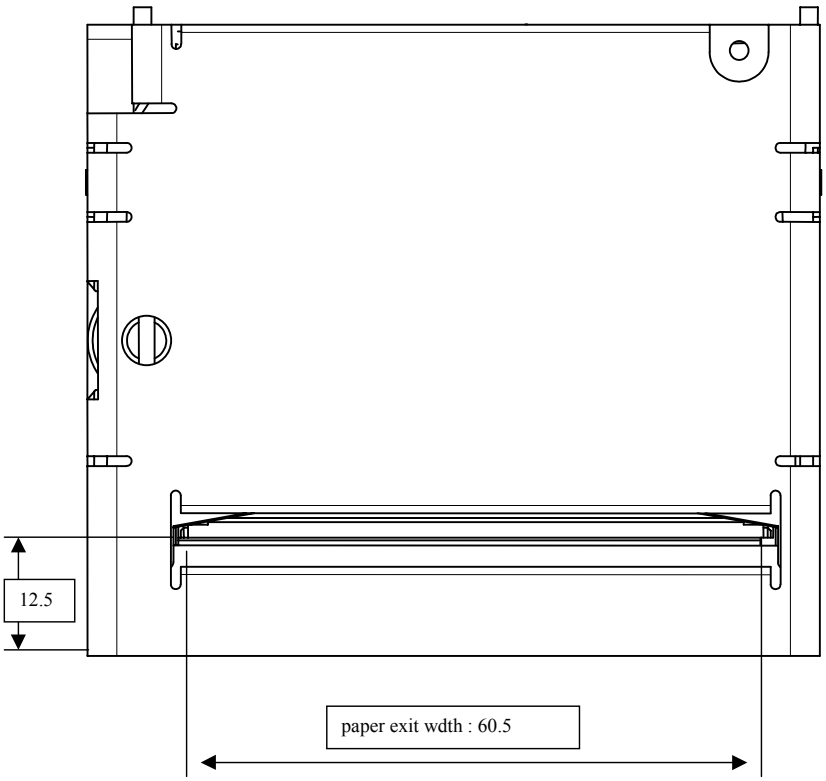


Fig. 4 cutter top view

The position of the end of paper opto-sensor relatively to the paper allows top off form detection.

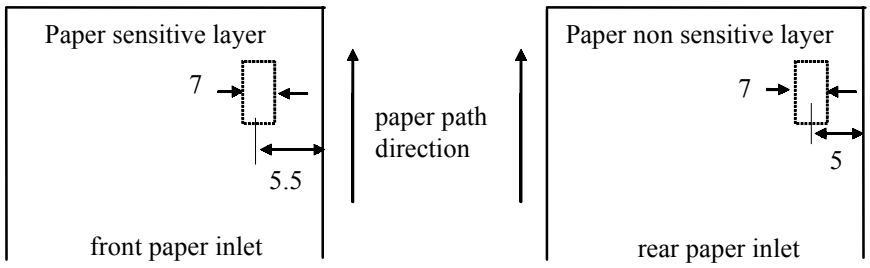


Fig. 5 Opto- sensor position

4 ELECTRICAL SPECIFICATION

4.1 Nominal Power supply

	Value	Units
Print head : Logic (Vcc) Dot line	 5 12	 VDC VDC
Stepping motor	12	V DC

4.2 Nominal Consumption

	Value	Units
Print head : Heating current / dot (Vch) at nominal values	0.025	mA
Logic current / dot (Vcc)	100	µA
Stepping Motor (2 activated phases) for paper feed	600	mA
Stepping Motor (2 activated phases) for cutter	1800	mA
Maximum instantaneous current per dot line (at 12V)	10.8	A

4.3 Description of print head

	Value	UNIT
Driver chips (64 bit CMos LSI)	6	-
Nominal dot resistance	480	ohms
Nominal dot energy (in standard conditions)	0.34	mJ
Max printing speed (with 12V power supply) (with dot historical control)	75	mm/sec

4.3.1 Function of each 64 bit IC (integrated circuit)

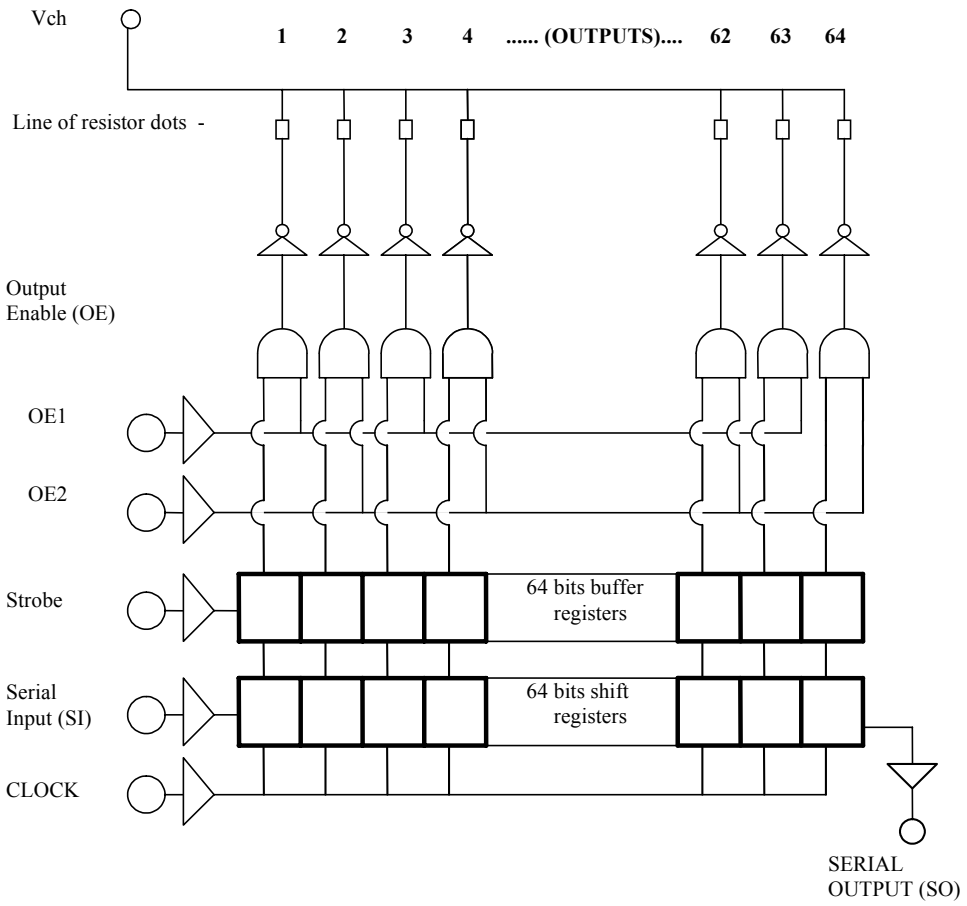


Fig.6 Driver IC schematic

These circuits are supplied by	**5V +/- 5% logic voltage**
Each circuit features	**64 open collector transistors**
	64-bit shift register
	64-bit memory register
Each circuit controls	**64 resistor dots on the print head**

The heating element power supply VCH is not connected to the Driver ICs but only to the resistive line of dots itself. The driver ICs are connected via a pattern of high current gold interconnecting traces to the line of resistor dots.

The dot line is of the interdigitated type, in order to maintain the tight definition of the dot geometry and resistance. In such a scheme the heating element power supply VCH forms a 'comb' of traces over which the resistive line of dots is laid. The outputs of the driver ICs form a second comb interdigitated with the first.

4.3.2 Operation of the complete module

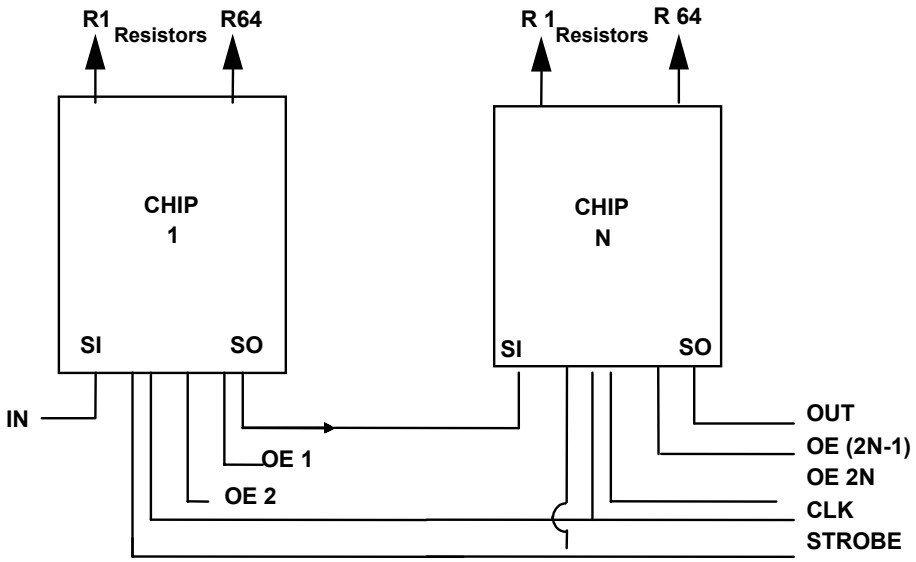


Fig.7

- Data to be printed is clocked into a shift register formed by cascading "n" chips.
- E.g. 384 dot head uses 6 chips with the SO output of chip 1 used as the SI input for chip 2 etc. Respectively, the SO output of chip 2 is used as the SI input for chip 3 etc.

After 384 clocks, the initial piece of data entered corresponds to the last (384th) dot of the line (the R64 output of the 6th chip). The last bit of data entered will correspond to the first dot of the line (R1 of the first chip).

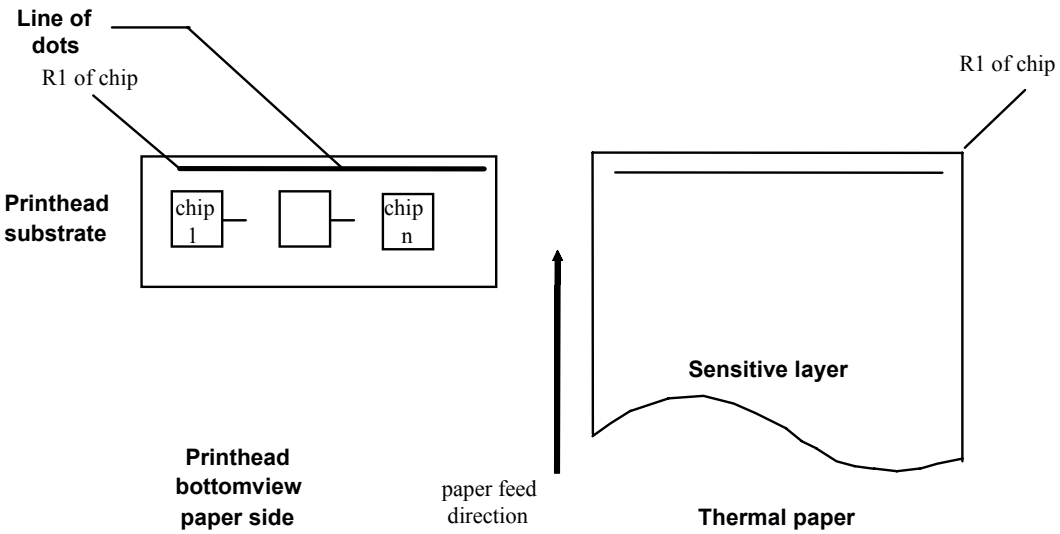


Fig.8 Routing of data to the resistor dots

4.3.3 Electrical specifications of 64-BIT LSI driver

4.3.3.1 General

PARAMETER	MIN	MAX	UNIT
Max. voltage at outputs 1 to 64		**16**	**V**
Max. input voltage		**Vch**	**V**
Max. output current/dot*		**28**	**mA**
Total max. output current *		**10.8**	**A**

* at nominal value

4.3.3.2 Other

The specifications given below are given for the following conditions:

- Room temperature
- Logic voltage on chip:4.75 V < Vdd < 5.25 V
- Clock frequency: 4MHz

Logic Current (5 V)	Conditions	Values	Symb
Current per controlled element (dot)	**-**	**-**	**Idd**
Min. high-level input voltage	**Vcc = 5V**	**0.7Vcc**	**Vih**
Max. low-level input voltage	**Vcc ≤ 5V**	**0.3 Vcc**	**Vil**
Max. high-level input current		**0.5µA**	**Iih**
Max. low-level input current		**0.5µA**	**Iil**
Min. high-level output voltage	**Vcc = 4.5**	**4.45 V**	**Voh**
Max. low-level output voltage	**Vcc = 4.5**	**0.05 V**	**Vol**
Max. high-level output current	**-**	**-**	**Iohmax**
Max. low-level output current	**-**	**-**	**Iolmax**

Heating current (RMDL)	Conditions	Values	Symb
Max. power output current	**Vdon=Vdonmax**	**27,3 mA**	**Idomax**
Max. output leakage current	**Vdon=24 V**	**10 µA**	**Idoleak**
Max. output voltage	**Idout=Idomax**	**800 mV**	**Vdonmax**

4.3.3.3 Timing

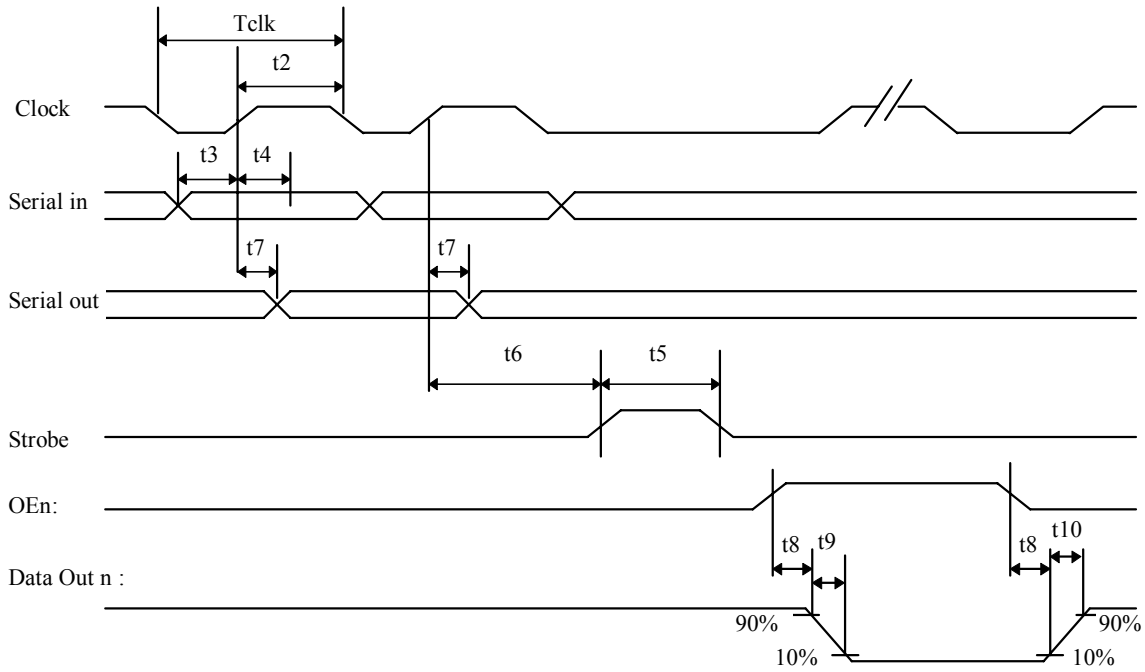


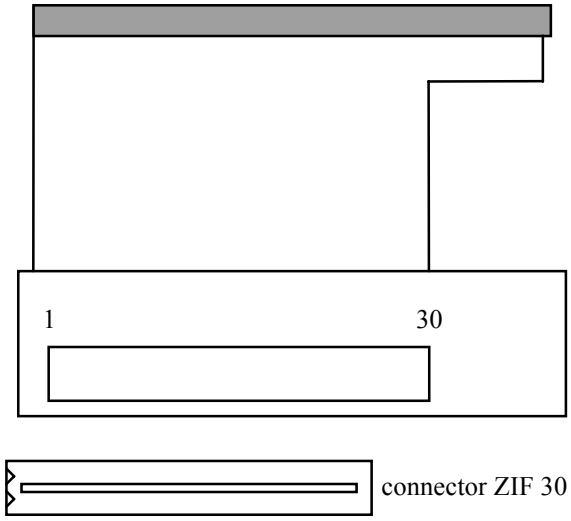
Fig.9 Timing diagram

Sym	Description	Min	Max	Unit
Tclk	**Serial clock period**	**250**		**ns**
t2	**Clock pulse width**	**70**		
t3	**Data in to clock setup time**	**50**		**ns**
t4	**Data in from clock hold time**	**10**	**220**	**ns**
t5	**Strobe high time**	**100**		**ns**
t6	**Clock to strobe delay time**	**100**		**ns**
t7	**Serial data out from clock delay**		**120**	**ns**
t8	**OE to data out delay time**		**2**	**µs**
t9	**Data out fall time, 10% -> 90%**		**0.5**	**µs**
t10	**Data out rise time, 10% -> 90%**		**2**	**µs**

4.3.4 Print head Connection

PINOUT OF ZIF 30 CONNECTOR

PIN N°	SIGNAL	PIN N°	SIGNAL
1	Vch	16	GND
2	Vch	17	GND
3	Cutter motor B2	18	GND
4	Cutter motor B1	19	GND
5	Cutter motor A1	20	GND
6	Cutter motor A2	21	Thermistor 1
7	Switch Out	22	Thermistor 2
8	Anode Opto-sensor	23	OE1
9	Collector Opto-sensor	24	Data In
10	Data Out	25	Paper feed motor B2
11	Clock	26	Paper feed motor B1
12	Strobe	27	Paper feed motor A2
13	OE3	28	Paper feed motor A1
14	Vcc	29	Vch
15	OE2	30	Vch



This connector (fitted on your printer) should be connected to your board with a 30 pins flex to another compatible connector.

Compatible connectors suppliers and references : Molex 5597 3951 3304 straight connector
: Molex 5597 3951 3303 bent connector
: Stocko MZF 9390 60 3030 straight connector
: Stocko MZF 8900 60 3030 bent connector

Chip connection

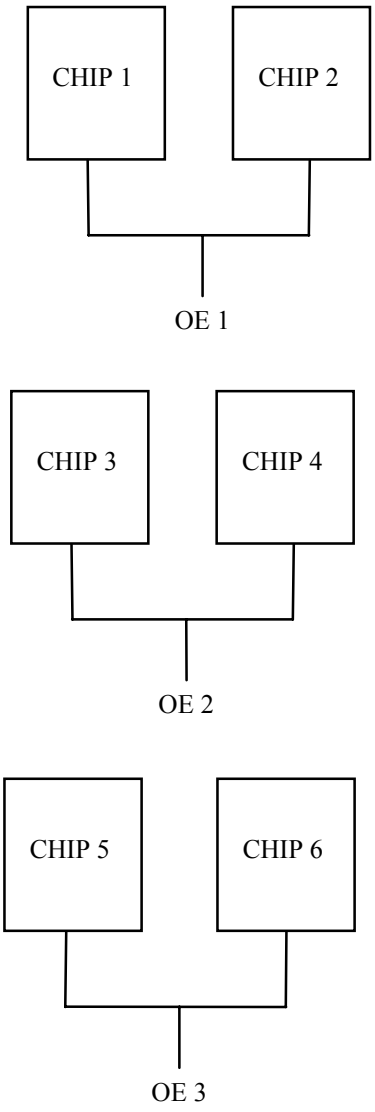


Fig.10

4.4 Bipolar paper feed motor

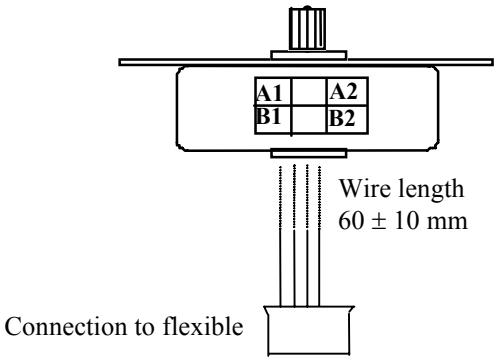
An optional bipolar motor is available for paper feed

4.4.1 General specification

Recommended control voltage:	12-24V
Coil resistance:	20 Ω ± 10%
Number of phases:	2+2
Step angle:	7° 30'
Paper feed for one printing line:	1
Recommended control current:	300 mA (peak)
Maximum starting frequency:	500 pps

4.4.2 Connections

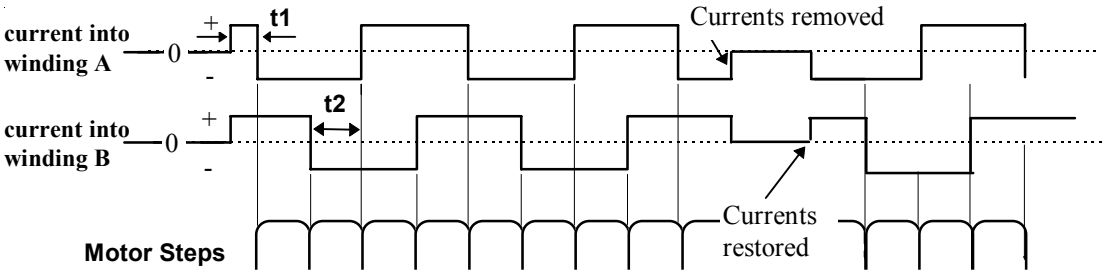
PIN n°	Wire color	Motor
1	black	A1
2	brown	A2
3	yellow	B1
4	orange	B2
5	empty	
6	empty	



4.4.3 Induction sequence and timing

	BLACK	YELLOW	BROWN	ORANGE
STEP 1	—	—	+	+
STEP 2	+	—	—	+
STEP 3	+	+	—	—
STEP 4	—	+	+	—

Voltage on cable is negative where shown as "-".
Voltage on cable is positive where shown as "+".



- There are 4 different conditions for the motor windings:

$$AB \Rightarrow \bar{A}B \Rightarrow \overline{AB} \Rightarrow A\bar{B} \Rightarrow AB$$

Where

$\bar{A}B$ **stands for "A is positive and B is negative" etc.**

This electrical sequence corresponds to a sequence of 4 consecutive mechanical positions. The sequence is repeated 12 times for each revolution.

- t1 = 0.4 ms
- t2 = 2 ms

Motor initialization

Once the initial winding currents have been applied they must be maintained for a time t1. Once this time has passed the motor may be operated by changing the winding currents in the usual way.

The same acceleration table can be used for bipolar motor than for unipolar motor (see page 18)

To take-up the play in the gears it is necessary to operate the motor for 16 steps before starting to print.

4.4.4 Bipolar stepping motor electric control

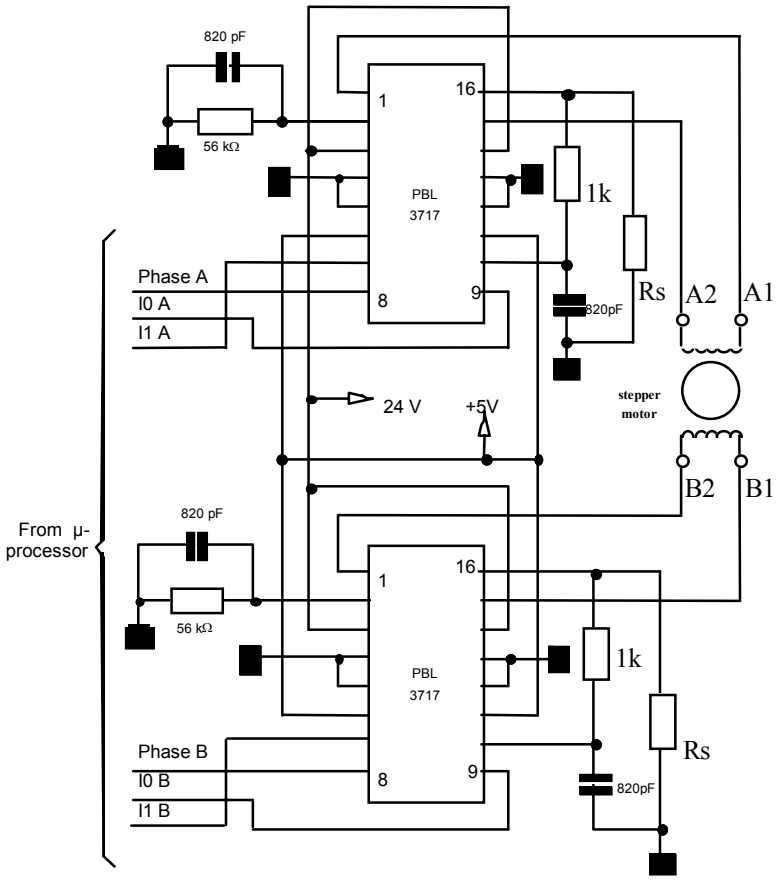


Fig.11 Example

Note 1: Rs: resistors of 0.8 ohm
With I0A and I0B = 1 and
I1A and I1B = 0 --->I = 0,3 A (the required control current for paper feed).
With I0A and I0B = 0 and
I1A and I1B = 0 --->I = 0,5 A (the required control current for cutter).

Note 2: With Rs = 0.462 ohm
With I0A and I0B = 0 and
I1A and I1B = 0 --->I = 0,9 A (the required control current for cutter when using 12V).

Note 3: To obtain 0.8 Ω or 0.462 Ω (which are not standard) it is necessary to set resistances with other values in parallel

For other stepping motor control requirements, please contact us.

4.5 Bipolar cutter motor

4.5.1 Overview

The cutter is mounted to the printer cover and includes parts below:

- Stepping motor
- Cutter drive wheel & rack
- Switch

This cutter can achieve partial or total cuts

4.5.2 General specification

Coil resistance:	2.5 Ω
Step angle:	15°
Number of steps per revolution:	24

4.5.3 Connection

Connected to the PCB

4.5.4 Induction sequence

	A1	A2	B1	B2
Step 1	-	+	-	+
Step 2	-	+	+	-
Step 3	+	-	+	-
Step 4	+	-	-	+

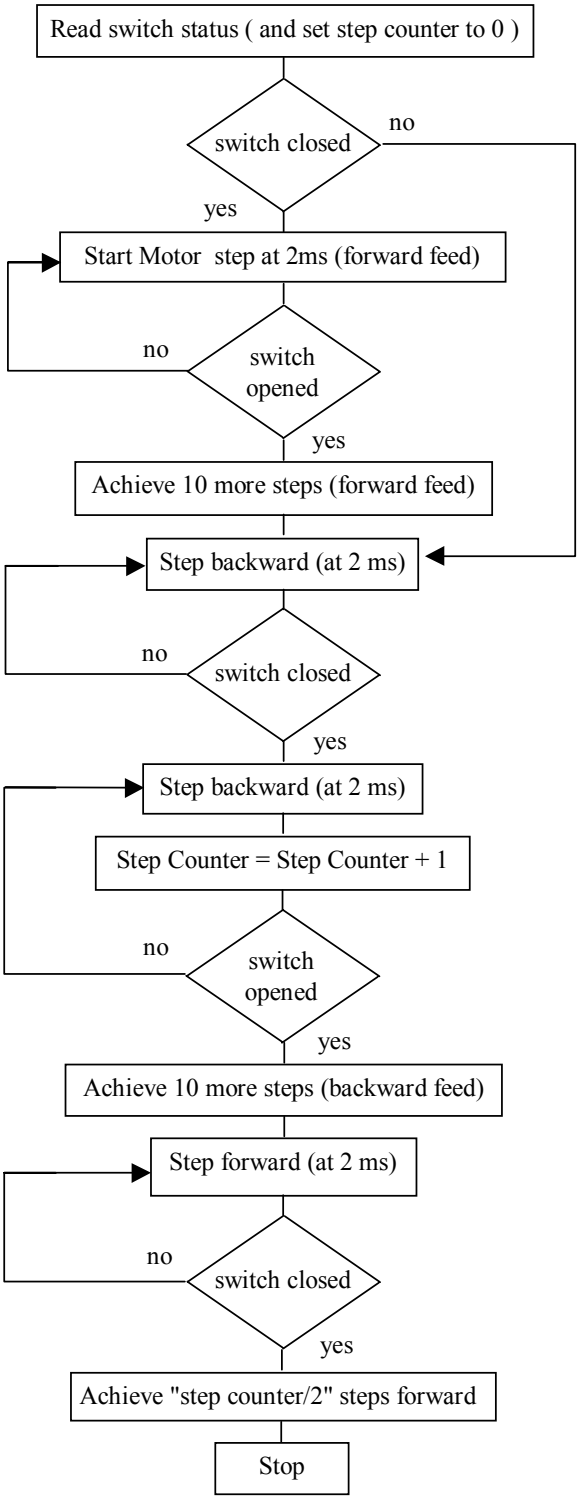
4.5.5 Cutter Initialization

The sequence described next page with logic chart allows the cutter to be well positioned when the system (mechanism & controller board) is powered on (or reset).

Note:
The logic chart is designed to place the cutter in the middle of the "closed switch area".

When ten additional steps in are achieved after a switch status reading, this avoids reading mistake due to switch bounce.

Cutter initialization logic chart:



4.5.6 Cutter Motor Acceleration Ramp-Up

The cutter can be started with a motor step time of 2 ms, and then the speed can be increased by reducing this cycle time up to 1 ms following the curve given here after.

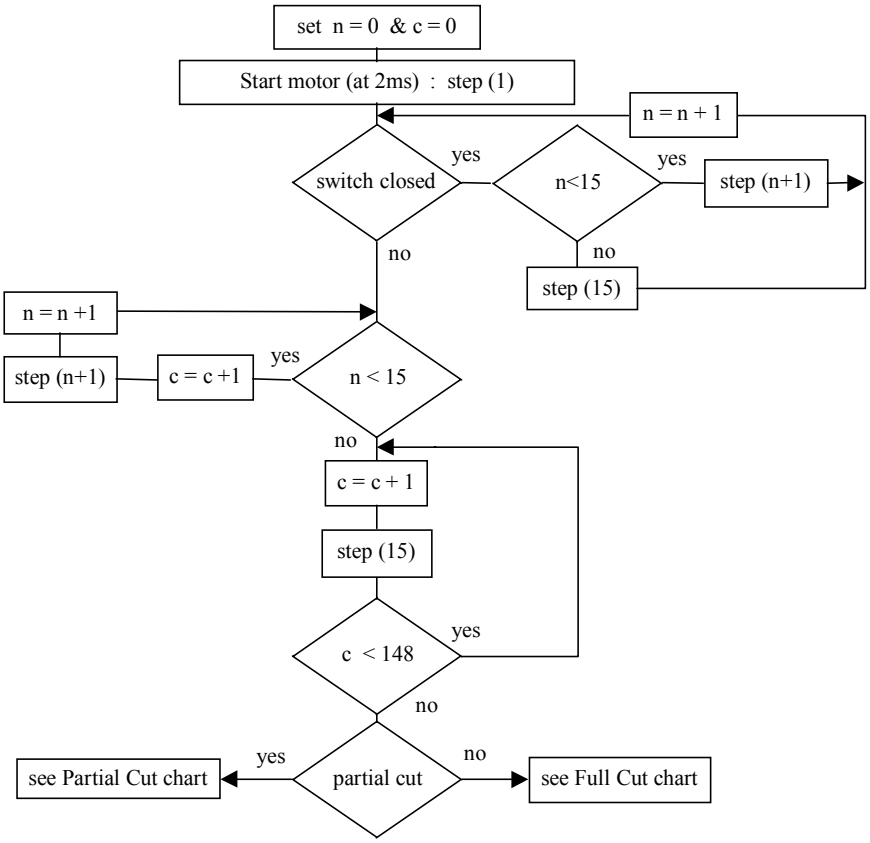
Step	1	2	3	4	5	6	7	8
Time (µs)	2000	2000	2000	2000	2000	1800	1660	1530

Step	9	10	11	12	13	14	15
Time (µs)	1420	1330	1250	1170	1110	1050	1000

Note:
- This curve uses 2000µs on the first 5 steps, this does not correspond to acceleration but to a routine applied in the next logic chart (where "step (n)" means one motor step is achieved with the step time given above).
- This acceleration ramp up can be used either for forward or backward blade movement.

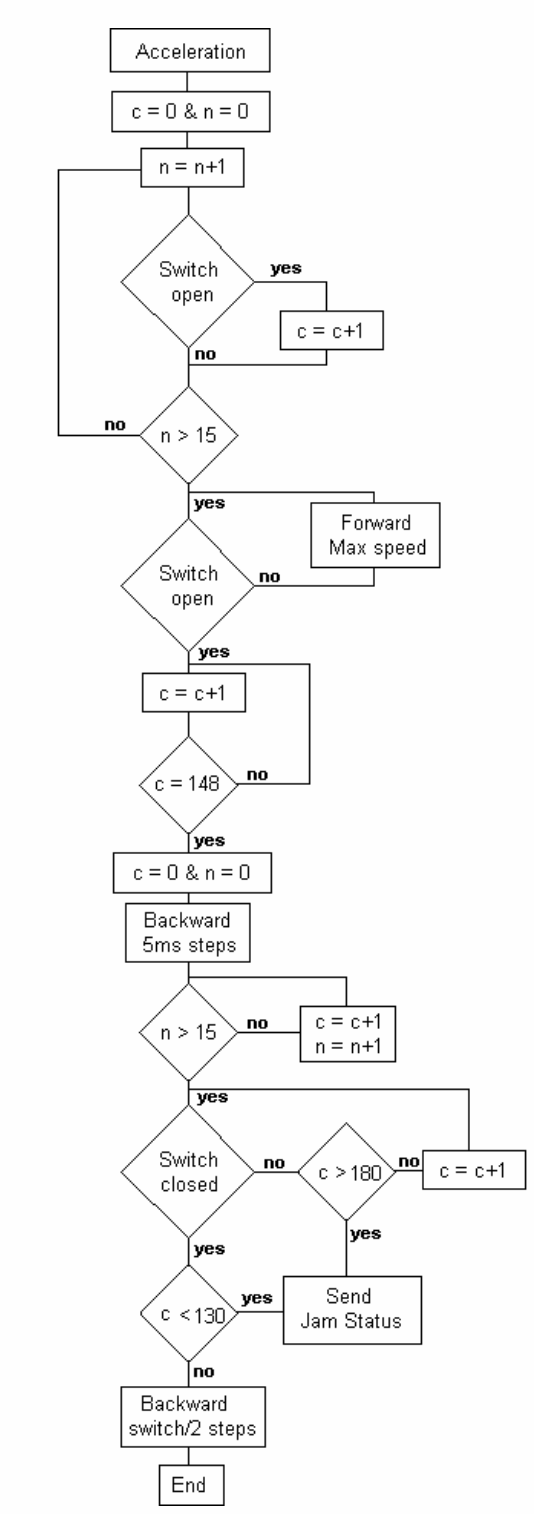
4.5.7 Cutter Driving Chart

This first chart allows starting the cutter with the acceleration ramp up previously given (for motor step time).

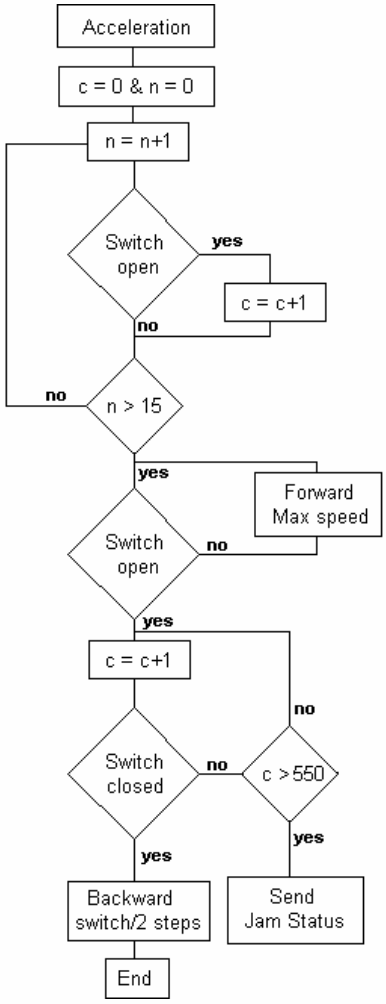


The chart changes now here depending on the type of cut required: partial or full cut.

PARTIAL CUT



FULL CUT



n is the number of steps for the cutter motor acceleration.

c is the number of steps for the total cycle of partial or full cut.

4.6 Cutter micro-switch specifications

4.6.1 General specification

Reference	DB3A-A1BA Switch Cherry
Contact resistance	50 mΩ Maximum.
Maximum Current	0,1A - 125 V AC (UL V0)
Maximum Rating	2 000 000 Open-Close cycles

4.6.2 Connection

Connected to the PCB with cutter motor and integrated to the flexible

Wires	Contact Status	'guillotine' blade
White / White	Open	Closed
	Closed	Open

Micro-switch characteristics will be given later.

4.7 Opto-sensor specification

4.7.1 Electrical characteristics

Absolute Maximum ratings

	Symbol	Rating	Unit
LED			
Continuous forward current	If	50	mA
Pulsed forward current *	Ifp	1	A
Reverse voltage	Vr	5	V
Max. power dissipation at 25°C max	P	75	mW
PHOTO-TRANSISTOR			
Collector emitter voltage	Vceo	30	V
Collector current	Ic	20	mA
Collector dissipation at 25°C max	Pc	50	mW

* (Time On, Time Off) T On = 100µs, T On + T Off = 10 ms
***Note*:** Driving the sensor with pulse current allows using higher current to improve paper detection.

Input/Output Conditions

	SYMBOL	CONDITIONS	Min.	TYP.	Max.	UNIT
LED						
Forward voltage	**VF**	**IF=10 mA**			**1.3**	**V**
Reverse current	**IR**	**VR=5v**			**10**	**µA**
TRANSFER CHARAC.						
Collector dark current	**ICE0**	**VCE=10V**			**200**	**nA**
Light Current	**IL**	**VCE= 5V, IF=10mA**	**90**			**µA**
Leakage Current	**ICE0D**	**VCE= 5V, IF=10mA**			**200**	**nA**
Rise time	**tr**	**VCE= 2V, IC=100µA**		**30**		**µs**
Fall time	**tf**	**RL= 1kΩ**		**25**		**µs**
Peak wave length	**λp**			**940**		**nm**

4.7.2 Connection

Connected to the PCB, the opto-sensor is then clipped in front or bottom position.

4.7.3 External circuit

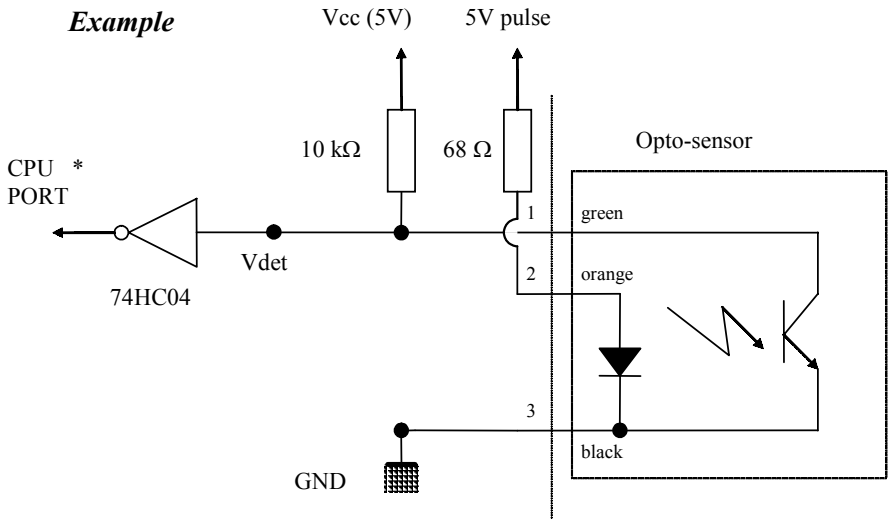


Fig. 12

***Note*:** When paper is detected Vdet < 2.25V.

* Rise time and fall time depend on the voltage and current driving conditions.
In the example above we recommend to measure the sensor response 300 µs after the current leading edge of the pulse (or current establishment) in the sensor LED.

5 PRINTER CONTROL TECHNICS

Printer control techniques in order to operate the printer. We depict hereafter three possible modes.

5.1 Mode 1

The paper feeds itself automatically during the heating cycle thereby permitting a high speed to be achieved. (in this mode, it is recommended to use historical control, see page 35)

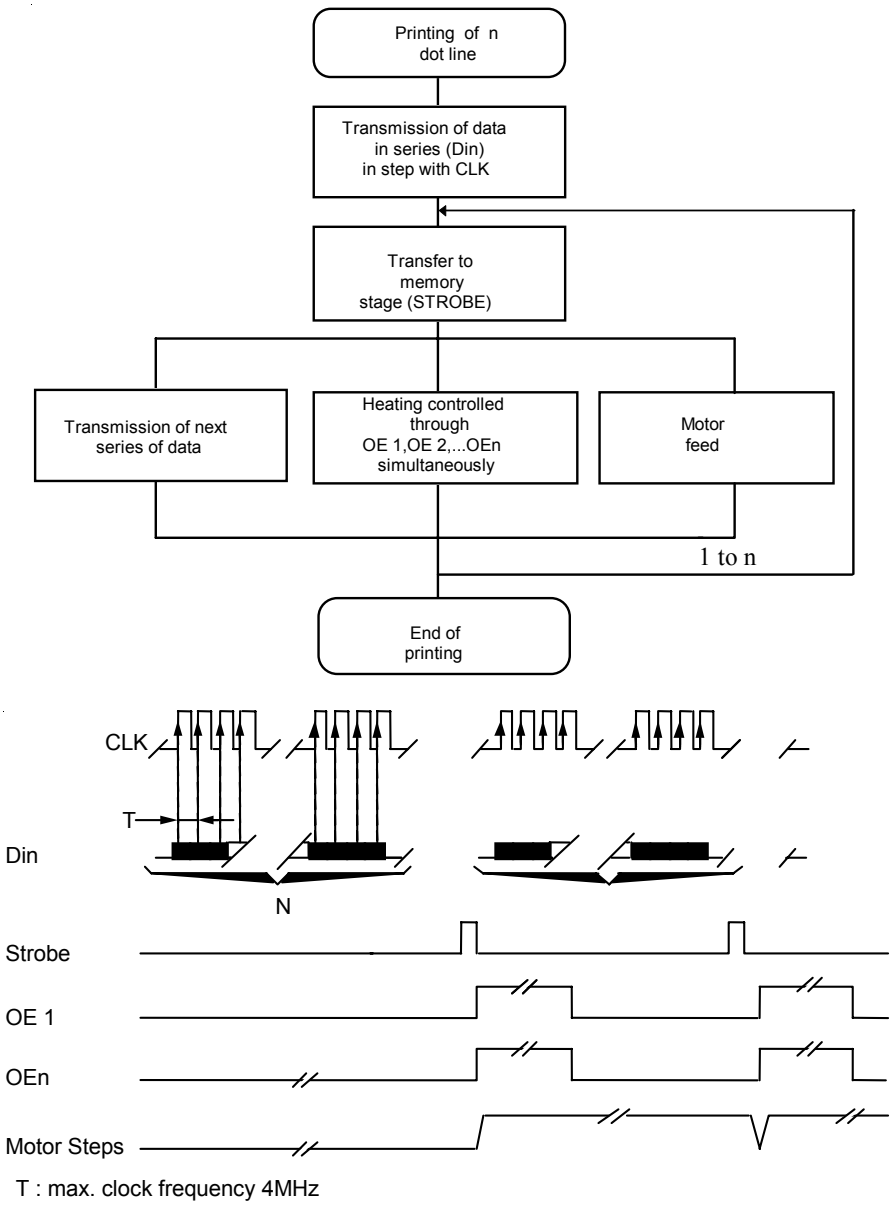


Fig. 13 Timing diagram for mode 1

5.2 Mode 2

The paper feed occurs after the heating cycle giving high quality printing.

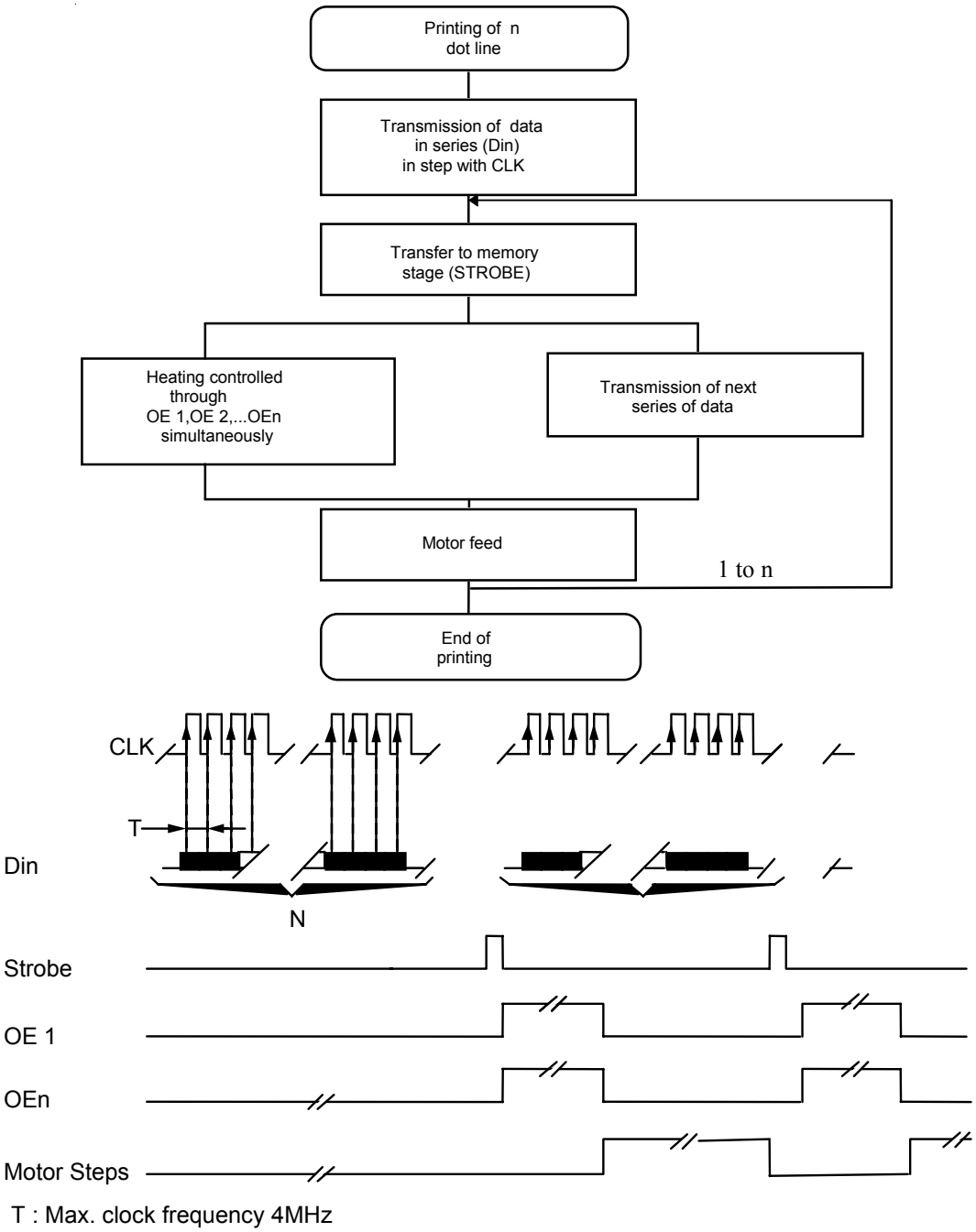
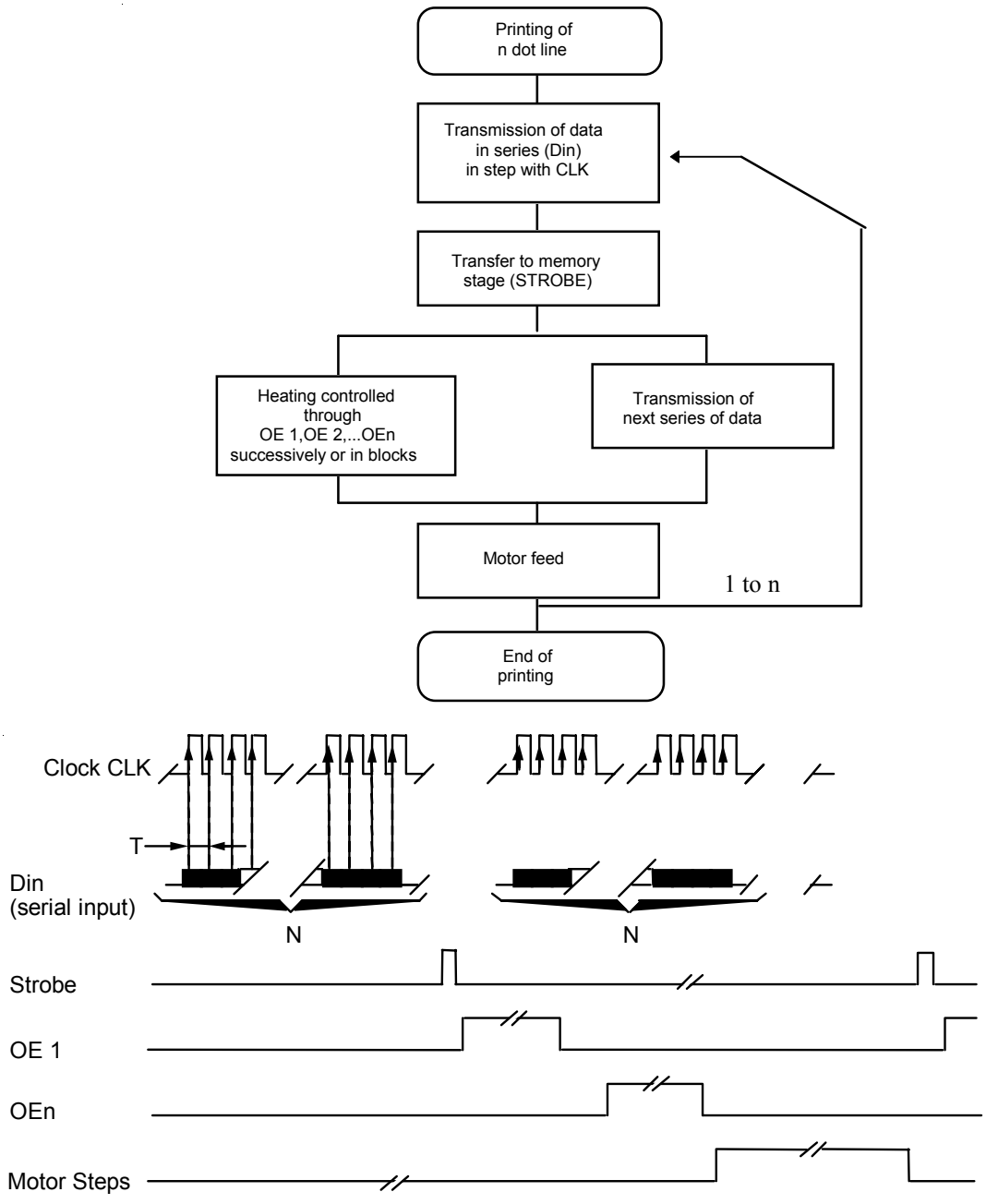


Fig. 14 Timing diagram for mode 2

5.3 Mode 3

This mode is used in conditions where there is a limit of electrical current. The dot line is printed in stages heating only a portion of the line at a time, effectively giving reduced consumption.



T : Max. clock frequency 4MHz

Fig. 15 Timing diagram for mode 3

6 RECOMMENDATIONS

6.1 Mechanical Recommendations

Never apply mechanical stress to the printer; this could result in misalignment and thus degradation of the print quality.
The thermal print head must have 1 degree of freedom. Never hinder the print head from pivoting on its axis.

6.2 Housing design recommendations

Forecast space for paper guide to use one of the two possible paper inlets (or both).

When the front paper inlet is used, we recommend an additional paper guiding to facilitate correct paper introduction.

See the fixation position, make sure it is easy enough to release printer, this operation is necessary for easy maintenance (change of print head for example).

Space to open cover: the cover (which contains the cutter) is strongly clipped, it is necessary to leave enough place to catch it in order to open it.

6.3 Energizing & de-energizing printer

When energizing the thermal print head (Vcc, 5 V) it is important to apply all the logic signals within 10 ms (particularly to de-energies all the OEs).

If the line of dots (Vch, 12 V) is supplied before the control logic, resistor dots may be destroyed. Because the control logic has a random state, resistors might be heated for a longer period than the specified maximum, burning out the heated resistor.

To avoid this, we recommend applying the heating voltage (Vch) after the logic supply voltage (Vcc, 5V).

The same precaution should be taken when shutting down. The supply voltage Vch must be switched off before the logic supply voltage Vcc. Care should be taken to allow enough time for residual capacitive charge to dissipate.

6.4 Printing recommendations

- In order to avoid excessive noise from the stepper motor, avoid using it at the following frequencies: between 150 and 250 pps (for better printing quality, avoid fast speed variations).
- To avoid the paper feed motor temperature rise, use a time ratio of 2 "on" 3 "off" up to 2 minutes maximum of continuous printing.

Example: 2 seconds "on" followed by 3 seconds "off"; 20 seconds "on" followed by 30 seconds "off".

6.5 Recommendations for paper

- As paper roll bearing, use an AXIOHM reference (or approved by).
- Use a paper roll of maximum diameter 80 mm when paper slides on its bucket, this value can be overshot up to 120 mm when paper roll is mounted on a friction-less axis (the maximum diameter also depends on the acceleration ramp up because of inertia).
- Leave the paper stock spool free to turn.
- The printer should not operate without paper as this will damage the surface of the platen.
- Paper with bad factor may affect the print head life.

6.6 General

- Ensure that there is adequate air circulation around the print head support/heat sink as poor ventilation of the print head can degrade the print quality.
- Never open the cover whilst the cutter is operating.
- Never introduce tools inside the printer, wires could be de-soldered or short circuited.
- It is very important that the print head support/heat sink is connected to the customer appliance chassis (see p16 pinout connection GND).
- Ensure that the cutter blades are in the correct position before use in order to ensure that they do not deteriorate.
- When continuous printing is performed, the supply energy should be reduced so that the head temperature monitored through the thermistor will remain below the maximum temperature.
- When setting 'power on / power off', strobe (STR) shall be on 'disable'.
- Heat elements and IC's shall be anti-electrostatic in order to prevent electrostatic destruction. Do not touch the connector pins with fingers.
- Make sure no foreign particles roll on the head surface, this would cause damage.
- If condensation occurs, do not switch on the printer until it has disappeared.

6.7 Cleaning recommendations

The RMDL mechanisms are high reliable units which require very little maintenance but may benefit from cleaning as detailed below.
Depending on the environment in which the printer is used, the printer can accumulate dust. Therefore it is necessary to clean it periodically in order to maintain a good print quality. The cleaning period is dependant on the environment and the usage of the printer, but the print head should be cleaned at least once a year or up to one month in heavy duty applications. The print head should always be cleaned immediately if the print becomes visibly fainter due to its contamination.
Cleaning Instructions:

- Switch off printer. **Never clean the head immediately after printing, the head may be hot**.
- Open the printer cover and remove the paper from its slot.
- Clean the heating dots of the head with a cotton stick containing a solvent alcohol (ethanol, methanol, or IPA); **do not touch the print head with your fingers!**
- Allow the solvent to dry.
- Reload the paper and close cover.

N.B AXIOHM is able to provide cleaning kits **Ref: CK60000A**.

6.8 Specific recommendations for cutter

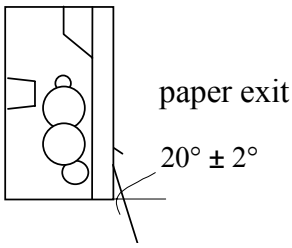
Mechanical stress should not be applied to the cutter cover; it would lead to a blade movement perturbation.

Make sure the ground is connected. Ground must stay connected while operating and manipulating the cutter cover.

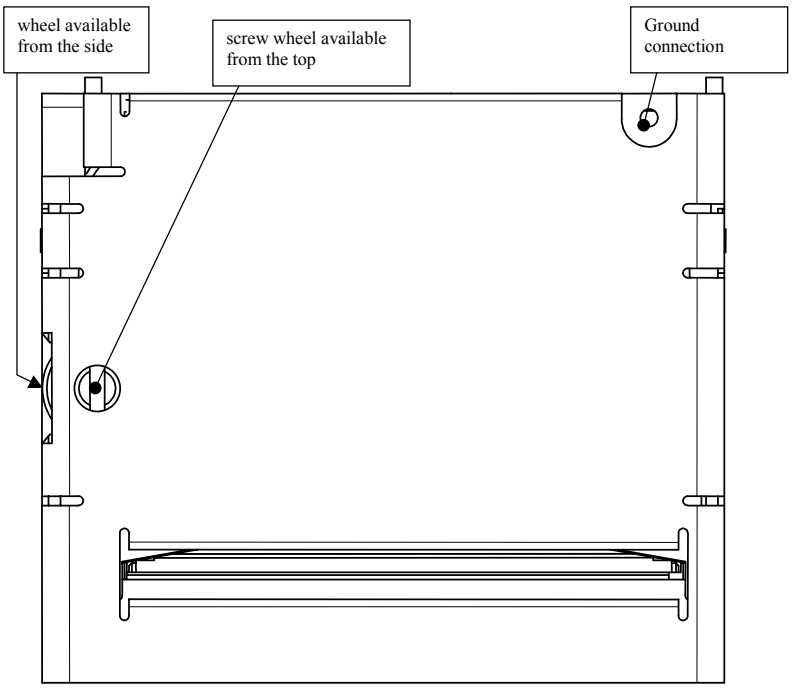
Do not keep the cutter motor phase "on" while the cutter is not operating (this would also lead to an increasing motor temperature).

To avoid paper jam, it is recommended to feed 2 mm of paper (16 motor steps) after cutting.

A vertical position, as shown on next drawing, is better for paper dust elimination.



To release blades in case of jam, use the wheel shown on next drawing:



7 APPENDICES

7.1 APPENDIX 1: Thermistor specifications

GENERAL CHARACTERISTICS	
Maximum operating temperatures	**-20° C to + 80° C**
Rated resistance at 25° C	**Rn (see table of values)**
Tolerance for Rn	**5 %**
Thermal dissipation factor	**_ = 5 mW/°C**
Thermistor time constant/dot line	**t = 30 sec**
Resistance value as a function of temperature (see curves)	

This thermistor has a rated value of 100 kΩ. Its resistance variation can be expressed as follows:

$R = Rn \exp B \left(\frac{1}{T} - \frac{1}{Tn}\right)$ where T is in kelvin degrees (°K)

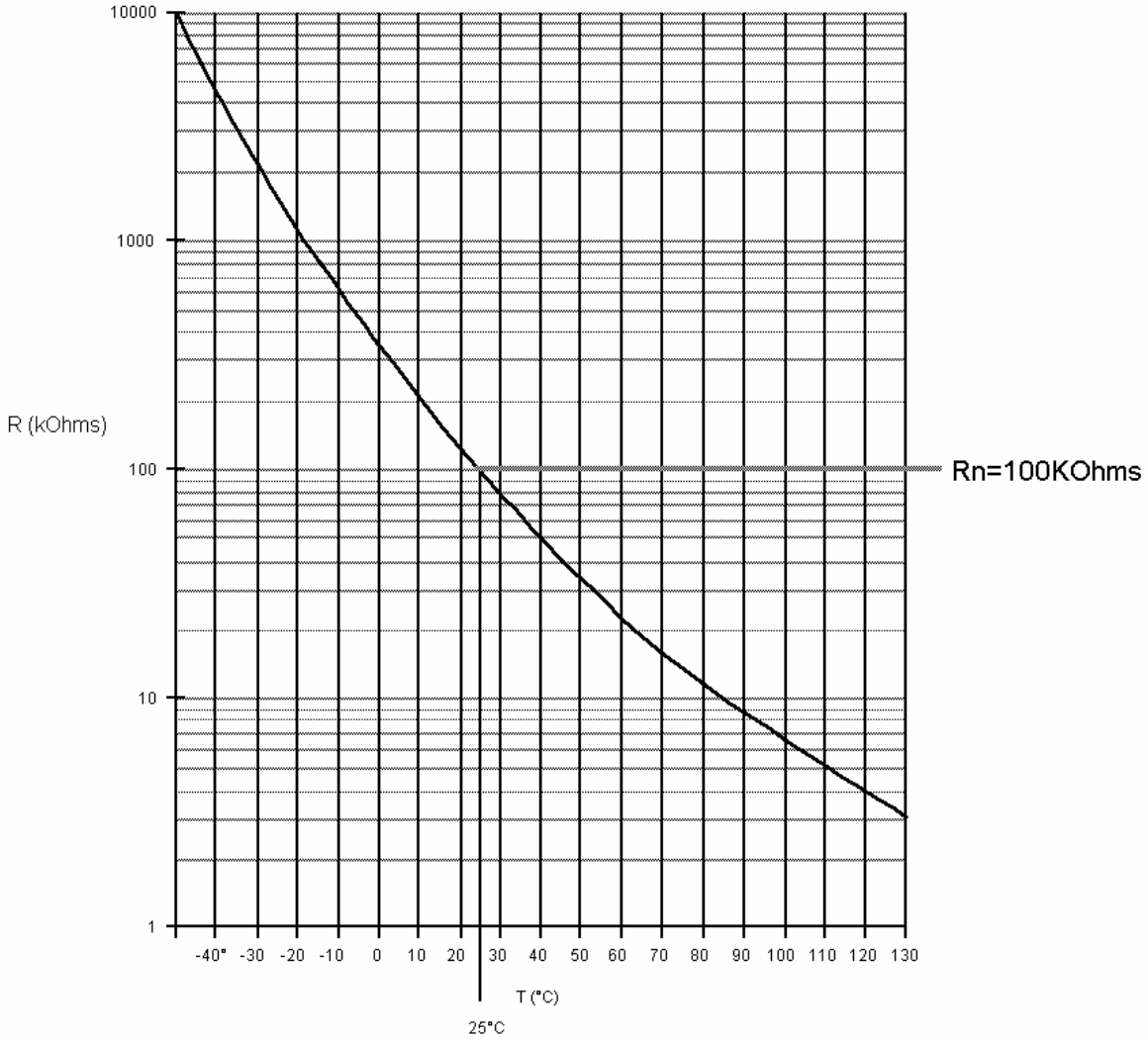
B = 4066° K

Rn = reference value at temperature Tn (295° K)

The main specifications of the thermistor are listed in the following pages.
NTC thermistor, rectangular size (IEC 12.05), silver palladium metallic coating.

APPENDIX 1 (Contd.)

RESISTANCE/TEMPERATURE VARIATION for RMxx



7.2 APPENDIX 2: Paper specification

KANZAN paper type KP440.
Paper roll dimensions:

2320061: ∅50 x 60mm x 30m

Property	Method	Value	Unit
Grammage	**ISO 536**	**58 ± 5**	**g/m2**
Thickness	**ISO 534**	**60 ± 5**	**µm**
Surface smoothness	**ISO 5627**	**250 min.**	**sec**
Brightness	**ISO 2470**	**75 min.**	**%**
Tensile strength MD/CD	**ISO 1924/1**	**3.3 min./2 min.**	**KN/m**
Static initial activation temperature	**OD = 0.2**	**75±5**	**°C**
Static activation temperature	**OD = 0.8**	**85±5**	**°C**
Tearing Strength MD/CD	**ISO 1974**	**250 min.**	**mN**
Image Color	**-**	**Black**	**-**
Moisture content	**ISO 287**	**6.5 ± 1**	**%**

7.3 APPENDIX 3: Heating time and historical control

Heating time table is given on next page (with the paper reference KP440).
The motor cycle time for one dot line is given in the second top line of tables; it is the time for one motor step.
The column 3 (indicated with: speed <xxx mm/s and motor cycle time > xxx ms) gives the required heating time, giving the necessary energy to obtain an optical density of 1.2.

Three areas are then defined in table:

Area 1: "white"
The motor cycle time for one dot line (line2) is greater than the heating time indicated in column 3.

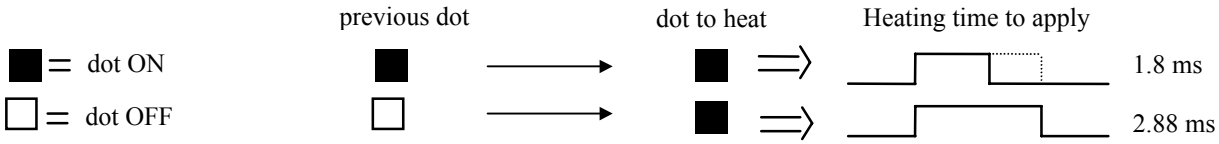
Area 2: high lighted
The heating time in column 3 is greater than the motor cycle time.

Area 3: (indicated by *)
The indicated heating time (depending on speed, voltage and temperature) would be greater than the motor cycle time.
In areas 1 and 2, heating time can be controlled either with or without historical control.
In areas 3, printer cannot be operated.

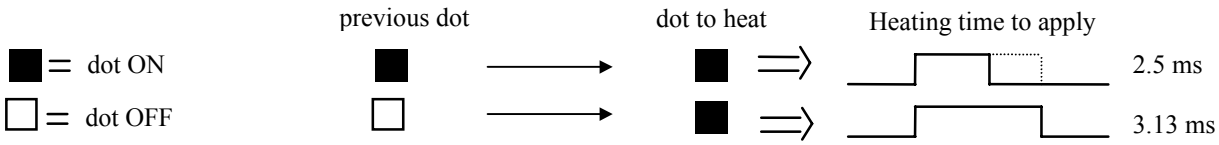
How to use tables?

- Without historical control: Apply the indicated heating time given as a function of speed, voltage and temperature. At high speed, printing quality for isolated dots might be affected with this method.
Example: in table at 40 mm/s, 40°C and 10 volts, heating time = 3.1 ms.

- With historical control in area 1: Apply the indicated heating time (function of speed, voltage and temperature) when the dot has been heated on the previous dot line, and the time from column 3 when it has not. This method gives the best printing quality.
Example: at 40 mm/s, 50°C and 10 volts:



With historical control in area 2: Apply the indicated heating time (function of speed, voltage and temperature) when the dot has been heated on the previous dot line, and the motor cycle time when it has not. At high speed, printing quality for isolated dots might be slightly affected with this method.
Example: at 40 mm/s, 0 °C and 10 volts:



Heating time for CM/RMDL (with paper KP440 and print head resistance = 480 Ω)

Voltage (V)	Temperature (°C)	Speed (mm/s) (R=480 Ohms)						
		< 10 mm/s	20 mm/s	40 mm/s	50 mm/s	60 mm/s	70 mm/s	75 mm/s
Temps moteur pour un pas		12,500 ms	6,250 ms	3,130 ms	2,500 ms	2.080 ms	1,790 ms	1,670 ms
10,00 V	**0 °C**	3,990 ms	3,240	2,500	2,250	2.050	<None>	<None>
10,00 V	**10 °C**	3,770 ms	3,060	2,360	2,130	1.940	1.790	<None>
10,00 V	**20 °C**	3,550 ms	2,880	2,220	2,000	1.820	1,680	1,610
10,00 V	**25 °C**	3,430 ms	2,790	2,150	1,940	1.770	1,630	1,560
10,00 V	**30 °C**	3,320 ms	2,700	2,080	1,870	1.710	1,570	1,510
10,00 V	**40 °C**	3,100 ms	2,520	1,940	1,750	1,590	1,470	1,410
10,00 V	**50 °C**	2,880 ms	2,340	1,800	1,620	1,480	1,360	1,310
11,00 V	**0 °C**	3,350 ms	2,720	2,090	1,890	1,720	1,590	1,520
11,00 V	**10 °C**	3,160 ms	2,570	1,980	1,780	1,630	1,500	1,440
11,00 V	**20 °C**	2,980 ms	2,420	1,860	1,680	1,530	1,410	1,350
11,00 V	**25 °C**	2,880 ms	2,340	1,800	1,630	1,480	1,370	1,310
11,00 V	**30 °C**	2,790 ms	2,260	1,740	1,570	1,430	1,320	1,270
11,00 V	**40 °C**	2,600 ms	2,110	1,630	1,470	1,340	1,230	1,180
11,00 V	**50 °C**	2,410 ms	1,960	1,510	1,360	1,240	1,140	1,100
12,00 V	**0 °C**	2,850 ms	2,320	1,780	1,610	1,47	1,350	1,300
12,00 V	**10 °C**	2,690 ms	2,190	1,680	1,520	1.380	1,280	1,220
12,00 V	**20 °C**	2,530 ms	2,060	1,580	1,430	1,300	1,200	1,150
12,00 V	**25 °C**	2,450 ms	1,990	1,530	1,380	1,260	1,160	1,120
12,00 V	**30 °C**	2,370 ms	1,930	1,480	1,340	1,220	1,120	1,080
12,00 V	**40 °C**	2,210 ms	1,800	1,380	1,250	1,140	1.050	1,010
12,00 V	**50 °C**	2,050 ms	1,670	1,280	1,160	1.060	0,970	0,930
13,00 V	**0 °C**	2,460 ms	2,000	1,540	1,390	1,260	1,160	1,120
13,00 V	**10 °C**	2,320 ms	1,880	1,450	1,310	1,190	1,100	1,060
13,00 V	**20 °C**	2,180 ms	1,770	1,360	1,230	1,120	1.030	0,990
13,00 V	**25 °C**	2,110 ms	1,720	1,320	1,190	1,090	1.000	0,960
13,00 V	**30 °C**	2,040 ms	1,660	1,280	1,150	1.050	0,970	0,930
13,00 V	**40 °C**	1,910 ms	1,550	1,190	1,080	0,980	0,900	0,870
13,00 V	**50 °C**	1,770 ms	1,440	1,110	1,000	0,910	0,840	0,810
14,00 V	**0 °C**	2,140 ms	1,740	1,340	1,210	1,100	1,010	0,970
14,00 V	**10 °C**	2,020 ms	1,640	1,260	1,140	1.040	0,960	0,920
14,00 V	**20 °C**	1,900 ms	1,540	1,190	1,070	0,980	0,900	0,860
14,00 V	**25 °C**	1,840 ms	1,490	1,150	1,040	0,950	0,870	0,840
14,00 V	**30 °C**	1,780 ms	1,450	1,110	1,000	0,920	0,840	0,810
14,00 V	**40 °C**	1,660 ms	1,350	1,040	0,940	0,850	0,790	0,760
14,00 V	**50 °C**	1,540 ms	1,250	0,960	0,870	0,790	0,730	0,700

7.4 APPENDIX 4: Changing the print head

The print head kit contains the opto-sensor and the flexible, it is necessary to change the whole kit.

Instructions to change print head:

Remove existing print head:

- unscrew chassis
- remove print head springs
- unclip flex
- unclip the opto-sensor and release wires
- unscrew paper feed motor and remove it
- pull out the print head

Fit the new one:

- fit the new print head
- fit and screw the paper feed motor
- fit the opto-sensor wires and clip the opto-sensor
- clip the flex cable
- fit the print head springs
- fit and screw the chassis

8 PAPER SUPPLIERS

KANZAN paper
Reference: KP440 (reference 2320061) (*see appendix 2 for specifications*).

9 SPARE PARTS LIST

All spare parts kits are supplied as individually packaged loose parts. It is possible to obtain different groups of spare parts kits. AXIOHM customer service will provide the list later.

10 ACCESSORIES

Reference	Designation	Contents

10.1 Cable kits

3106959	**SHORT FLEX CABLE KIT 30 CONTACTS (180MM)**	*Lot of:*
For Products:	All CM/RMDLxxxx short flex	30 contacts 180mm flex cable (x10)

3107044	**LONG FLEX CABLE KIT 30 CONTACTS (250MM)**	*Lot of:*
For Products:	All CM/RMDLxxxx long flex	30 contacts 250mm flex cable (x10)

11 COMSUMABLE PARTS

Available through AXIOHM distributors.

Reference	Designation	Contents

11.1 Cleaning kits

CK60000A	**CLEANING KIT 60MM AXIOHM (10 units/kit)**	*Lot of:*
For Products:	All CM/RMDLxxxx	60mm Cleaning kits (x10)

11.2 Thermal papers

2320061	**THERMAL PAPER 60MMX30M**	*Lot of:*
For Products:	All CM/RMDLxxxx	Roll of 60mm x 30M thermal paper (x1)